

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE (USPTO)	
Application Serial Number	09/989,474
Confirmation Number	3151
Filing Date	November 20, 2001
Title of Application	Distributed Device Discovery Framework for a Network
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Group Art Unit	2451
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Attorney Docket Number	MS1-2657US

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## **Claim Amendments Submitted for Entry as an**

### **Examiner's Amendment**

## **CLAIM AMENDMENTS**

1-35. (Canceled)

36. (Currently Amended) A method for discovering network devices in a network having multiple subnets, the method comprising:

automatically selecting, from a plurality of inter-subnet discovery agents each installed on a respective one of a plurality of computing nodes within a particular subnet of the multiple subnets, a one of the plurality of the inter-subnet discovery agents as an active inter-subnet discovery agent (ASDA) for the particular subnet, the selecting based on at least one of operating system versions, primary (physical) memory sizes, or central processing unit (CPU) speeds of the plurality of computing nodes within the particular subnet;

discovering, by the ASDA of the particular subnet, ASDAs installed on a respective one of a plurality of computing nodes within neighboring subnets in the network, the discovering comprising:

sending, by the ASDA for the particular subnet, a multicast request for information about the ASDAs on the one or more neighboring subnets neighboring the particular subnet;

receiving, by the ASDA for the particular subnet, a unicast communication from each of the neighboring ASDAs on the one or more neighboring subnets, each unicast communication comprising a network address and an ASDA status of the respective neighboring ASDA that sent the unicast communication; and

storing, by the ASDA for the particular subnet, information from each of the received unicast communications in a list comprising identities, network addresses, and ASDA status of the neighboring ASDAs;

receiving, by the ASDA for the particular subnet, a network device discovery request from a resource discovery requester located on a different computing node within the particular subnet than the ASDA for the particular subnet, the network device discovery request requesting discovery information for a specified discoverable network device in the network;

propagating, by the ASDA for the particular subnet in response to receiving the network device discovery request, an inter-subnet network device search request for discovery information for the specified discoverable network device, the inter-subnet network device search request propagated ~~sent~~ to each of the neighboring ASDAs on the one or more neighboring subnets neighboring the particular subnet as identified in ~~by searching the~~ list, wherein each of the neighboring ASDAs receiving the inter-subnet network device search request in turn propagates the inter-subnet network device search request to ASDAs in subnets neighboring the one or more neighboring subnets neighboring the particular subnet and containing the neighboring ASDAs such that the request is propagated throughout the network; and

receiving, by the resource discovery requester from the one or more of the neighboring ASDAs that received the inter-subnet network device search request, a response comprising the discovery information for the specified discoverable network device, wherein ~~the one or more neighboring ASDAs receive a response to the respective inter-subnet network device search request sent from the one or more~~

~~neighboring ASDAs, the response forwarded to the one or more neighboring ASDAs from ASDAs in other neighboring subnets, the in turn propagating is forwarding~~ based on respective lists stored in each of the ASDAs of the respective subnets of the multiple subnets, each of the respective lists comprising identities, network addresses, and ASDA status of the neighboring ASDAs.

37. (Previously Presented) The method of claim 36, wherein the network device discovery request is a request to identify one or more printers in the network.

38. (Previously Presented) The method of claim 36, further comprising:  
receiving, by a computing node containing the ASDA for the particular subnet, a request from the resource discovery requester to provide discovery information for a discoverable network device;  
passing the request to the ASDA for the particular subnet;  
searching the list by the ASDA for the particular subnet; and  
issuing, by the computing node, a search request identifying the resource discovery requester to at least one neighboring ASDA included in the list.

39. (Previously Presented) The method of claim 38, further comprising:  
transmitting, by the computing node, to the resource discovery requester a response including resource discovery information corresponding to the discoverable network device.

40. (Previously Presented) The method of claim 36, further comprising:  
publishing, by one of the plurality of computing nodes, address information for one or more neighboring ASDAs into a network directory service.

41. (Previously Presented) The method of claim 40, wherein the network directory service comprises information from the respective lists stored in each of the ASDAs in the network.

42. (Currently Amended) The method of claim 36, wherein the computing node on which the ASDA for the particular subnet is located comprises a set of device discovery agents, and

further comprising determining, by the set of device discovery agents, discovery information for discoverable network devices in the particular subnet.

43. (Currently Amended) A computer memory storing computer-executable instructions for performing the acts of:

automatically selecting, from a plurality of inter-subnet discovery agents each installed on a respective one of a plurality of computing nodes within a particular subnet of the multiple subnets, a one of the plurality of the inter-subnet discovery agents as an active inter-subnet discovery agent (ASDA) for the particular subnet, the selecting based on at least one of operating system versions, primary (physical) memory sizes, or central processing unit (CPU) speeds of the plurality of computing nodes within the particular subnet;

discovering, by the ASDA of the particular subnet, ASDAs installed on a respective one of a plurality of computing nodes within neighboring subnets in the network, the discovering comprising:

sending, by the ASDA for the particular subnet, a multicast request for information about the ASDAs on the one or more neighboring subnets neighboring the particular subnet;

receiving, by the ASDA for the particular subnet, a unicast communication from each of the neighboring ASDAs on the one or more neighboring subnets, each unicast communication comprising a network address and an ASDA status of the respective neighboring ASDA that sent the unicast communication; and

storing, by the ASDA for the particular subnet, information from each of the received unicast communications in a list comprising identities, network addresses, and ASDA status of the neighboring ASDAs;

receiving, by the ASDA for the particular subnet, a network device discovery request from a resource discovery requester located on a different computing node within the particular subnet than the ASDA for the particular subnet, the network device discovery request requesting discovery information for a specified discoverable network device in the network;

propagating, by the ASDA for the particular subnet in response to receiving the network device discovery request, an inter-subnet network device search request for discovery information for the specified discoverable network device, the inter-subnet network device search request propagated ~~sent~~ to each of the neighboring ASDAs on the one or more neighboring subnets neighboring the particular subnet as identified in

by searching the list, wherein each of the neighboring ASDAs receiving the inter-subnet network device search request in turn propagates the inter-subnet network device search request to ASDAs in subnets neighboring the one or more neighboring subnets neighboring the particular subnet and containing the neighboring ASDAs such that the request is propagated throughout the network; and

receiving, by the resource discovery requester from the one or more of the neighboring ASDAs that received the inter-subnet network device search request, a response comprising the discovery information for the specified discoverable network device, wherein ~~the one or more neighboring ASDAs receive a response to the respective inter-subnet network device search request sent from the one or more neighboring ASDAs, the response forwarded to the one or more neighboring ASDAs from ASDAs in other neighboring subnets, the~~ in turn propagating is forwarding based on respective lists stored in each of the ASDAs of the respective subnets of the multiple subnets, each of the respective lists comprising identities, network addresses, and ASDA status of the neighboring ASDAs.

44. (Previously Presented) The computer memory of claim 43, wherein the network device discovery request is a request to identify one or more printers in the network.

45. (Previously Presented) The computer memory of claim 43, wherein the acts further comprise:

publishing, by one of the plurality of computing nodes, address information for one or more neighboring ASDAs into a network directory service.

46. (Previously Presented) The computer memory of claim 45, wherein the network directory service comprises information from the respective lists stored in each of the ASDAs in the network.

47. (Previously Presented) The computer memory of claim 43, wherein the acts further comprise:

determining, by the plurality of inter-subnet discovery agents, discovery information for one or more discoverable network devices present on the subnet.

48. (Previously Presented) The computer memory of claim 43, wherein the computing node on which the ASDA for the particular subnet is located comprises a set of device discovery agents, and

further comprising determining, by the set of device discovery agents, discovery information for discoverable network devices present on the particular subnet.

49. (Currently Amended) A system for automating network-wide resource discovery in a network having multiple subnets, the system comprising:



a particular subnet comprising:

a plurality of computing nodes having installed thereon local discovery agents configured to implement network device discovery requests within the particular subnet according to a local discovery protocol;

a resource discovery requester located on one of the plurality of computing nodes; and

an active inter-subnet discovery agent (ASDA) located on a different one of the plurality of computing nodes in the particular subnet than the resource discovery requester, the ASDA automatically selected from the local discovery agents based on at least one of operating system versions, primary (physical) memory sizes, or central processing unit (CPU) speeds of the respective plurality of computing nodes on which the local discovery agents are installed, wherein the ASDA is configured to:

create a list by sending a multicast request for information about neighboring ASDAs installed on a respective one of a plurality of computing nodes within each of the on neighboring subnets neighboring the particular subnet and receiving unicast responses from each of the neighboring ASDAs including a network address and an ASDA status of the respective neighboring ASDAs, wherein the list stores identities, network addresses, and ASDA status of each of the neighboring ASDAs;

receive, from the resource discovery requester, a network device discovery request requesting discovery information for a specified discoverable network device in the network; and

responsive to receiving the network device discovery request, propagate an inter-subnet network device search request for discovery information for the specified discoverable network device, the inter-subnet network device search request propagated sent to each of the neighboring ASDAs on the one or more neighboring subnets neighboring the particular subnet as identified in by searching the list, wherein each of the neighboring ASDAs receiving the inter-subnet network device search request in turn propagates the inter-subnet network device search request to ASDAs in subnets neighboring the one or more neighboring subnets neighboring the particular subnet and containing the neighboring ASDA such that the request is propagated throughout the network, ~~wherein the neighboring ASDAs receive a response to the inter-subnet network device search request, the response forwarded to the one or more neighboring ASDAs that received the inter-subnet network device search request~~ from ASDAs in other neighboring subnets; the in turn propagating is forwarding based on respective lists stored in each of the ASDAs of the respective subnets of the multiple subnets, each of the respective lists comprising identities, network addresses, and ASDA statuses of the neighboring ASDAs; and

wherein the resource discovery requester is configured to receive a response comprising the discovery information for the specified discoverable network device from the one or more of the neighboring ASDAs that received the inter-subnet network device search request.

50. (Previously Presented) The system of claim 49, wherein the network device discovery request is a request to identify printers in the network.

51. (Previously Presented) The system of claim 49, wherein a one or more of the plurality of computing nodes is configured to publish address information for neighboring ASDAs into a network directory service.

52. (Previously Presented) The system of claim 51, wherein the network directory service comprises information from the respective lists stored in each of the ASDAs.

53. (Previously Presented) The system of claim 49, wherein the one of the plurality of computing nodes on which the ASDA is located comprises a set of device discovery agents, and the set of device discovery agents are configured to determine discovery information for discoverable network devices present on the particular subnet.

54. (Previously Presented) The system of claim 49, wherein the local discovery protocol comprises one of universal plug and play (UPnP) or simple-location-protocol (SLP).

55. (Previously Presented) The system of claim 49, wherein the network discovery protocol comprises transmission control protocol/Internet protocol (TCP/IP).

## **Conclusion**

Applicant authorizes entry of the Currently Amended Claimss shown above as an Examiner's amendment if doing so will lead to allowance of the Application.

Respectfully Submitted,

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Dated: February 21, 2011